Contents

1.0 Purpose/Scope

This procedure provides a standardized method for the operation of the Quest Noise Pro DLX Personnel Noise Dosimeter. It should be used in conjunction with the SBMS Subject Area Noise and Hearing Conservation and IH SOP IH96250: *Noise Measurement Principles: Noise Dosimetry*. A special feature of this meter is the setting and display of alert levels. When exposures are above a predetermined alert level (Dosimeter 1) an indicator is observed on the LCD display. An optional vibrating belt clip may also be used to notify the worker of an over-exposure.

Employee exposure assessments for regulatory compliance should be made with a noise dosimeter, such as the Noise Pro DLX. Employees wear dosimeters as they move through the work area. The dosimeter logs a close representation to the actual noise exposure of the ear as the distance from the source changes with employee movements. The logged exposure data is compared to occupational exposure limits to determine compliance with hearing conservation regulations. The logged data provided by the Noise Pro DLX includes both OSHA and ACGIH records by pre-determined settings.

The Noise Pro DLX logging dosimeter is a microcomputer-based sound analyzing instrument for accumulating, displaying, and sending data to printers or computers. The Noise Pro DLX can function as a personal noise dosimeter, an area monitor or a survey event monitor. While the Noise Pro DLX can be used as a survey meter, other SPL meters designed as precision area survey meters offer more features (such as impact/ impulse capturing) and should be used for area surveys.

2.0 Responsibilities

2.1 Use of the Noise Pro DLX shall be limited to persons who act under the direction of a competent hazard assessment person and have demonstrated the competency to satisfactorily use the meter, as evidenced by experience and training, to the satisfaction of the existing qualification criteria set by BNL. See Section 7.

2.2 Personnel that perform exposure monitoring with this instrument are responsible to follow all steps in this procedure.

2.3 The data collected using this meter must have an appropriate evaluation of the hazard and risk by a knowledgeable Industrial Hygiene professional.

3.0 Definitions

Alert Level; A TWA level, which if reached or exceeded, is indicated on the unit display. The alert levels are factory set to the regulatory limits of Dosimeter 1. Additional user alert levels may be set using the Quest suite software.

CL: Criterion Level; The constant sound level in dB that, if applied for 8 hours, would accumulate a DOSE of 100%. (Used in Dose measurements.)

dB: Decibel: A non-dimensional unit used to express sound pressure levels. It is the log of the ratio of the measured sound pressure level to a reference level.

dBA: A sound pressure level in decibels made on the A-scale of a sound level meter. This unit of measure approximates the response of the human ear.

dBC: Sound pressure based on a nearly flat, non-weighted scale.

DOSE: A percentage of the maximum allowable noise that a worker can be exposed to per day. This is a computation that is based on the following variables: Criterion Level (CL), Lower Threshold (LT), and Exchange Rate (ER).

Dosimeter No.: The unit simultaneously calculates the OSHA Hearing Conservation (Dosimeter 1), OSHA regulatory (Dosimeter 2) and ACGIH TLV (Dosimeter 3) levels.

ER: Exchange Rate; The number of decibels that a sound must change to either halve or double the rate of dose accumulation. (3, 4, 5 or 6 dB exchange rates are common.)

LAVG: The average sound level, in decibels, for the measurement period based on a 4, 5, or 6 dB Exchange Rate (ER). If the ER is 3 dB, then LAVG becomes LEQ.

LEQ: Equivalent Continuous Sound Level; The average sound level for the measurement period based on a 3 dB ER. If the ER is 4, 5, or 6 dB, then LEQ becomes LAVG.

Occupational Exposure Limit: The maximum time weighted average (TWA) exposure permitted for employee exposure, based on the lesser of the OSHA Permissible Exposure Limit (PEL) or ACGIH Threshold Limit Value (TLV). See IH96250.

Study vs session: Each time the dosimeter is paused, the unit calculates results for the study. Typically, a session is multiple studies in a work day where the studies are separated by paused periods that allow for breaks and the lunch period. Results are calculated for each study and overall derived values for the session, which documents the daily exposure.

TL: Threshold Level; A preset level in decibels below which sound is not accumulated or averaged into LAVG, LEQ or DOSE.

4.0 Prerequisites

4.1 Area Access:

4.2.1 Contact the appropriate Facility Support Representative or Technician to obtain approval to enter radiological areas, if applicable. Verify with the appropriate Facility Support Representative or Technician if a Work Permit or Radiological Permit is needed or is in effect. If so, review and sign the permit.

4.2.2 Other areas may have specific restrictions and all necessary access requirements must be met.

5.0 Precautions

5.1 **Hazard Determination:**

5.1.1 The operation of this dosimeter does not cause exposure to any chemical, physical, or radiological hazards. The meter design does not cause significant ergonomic concerns in routine use.

5.1.2 The dosimeters do not generate Hazardous Waste.

5.1.3 By its very nature, noise dosimeters may be used in areas where excessive noise levels exist or are suspected to be present. Exposures to noise levels above the PEL and/or TLV may cause temporary or permanent hearing loss.

5.2 **Personal Protective Equipment:**

5.2.1 Use appropriate PPE for the work area. Hearing protection must be worn if the area has not been characterized for noise exposure or the ambient noise level is at or above 85 dBA. Required training and medical approval must be completed prior to wearing PPE. See IH96150 for guidance on PPE selection.

5.2.2 Additional PPE: Other appropriate PPE for the area being entered. Check with your FS representative.

5.3 **Dosimeter Calibration:** Failure to calibrate the Quest Noise Pro DLX prior to and post use may result in an increased margin of error in the results. All field testers must verify a valid calibration status in accordance with Section 6.0.

6.0 Procedure

Windscreen on the Microphone

6.1 **Equipment:** (Pictured in Appendix 9.1)

6.1.1 Meter Body

6.1.2 Microphone and windscreen (foam cylinder)

6.1.3 Calibrator

6.2 **Start and warming up the Noise Pro DLX** (picture of meter and description of controls and displays are contained in Appendix 9.1.)

6.2.1 **Turning the meter on:** Press the ***On/Off*** key.

6.2.2 **LOBAT:** If LOBAT lights, batteries have less than 8 hours of use and should be replaced.

6.2.3 **Warm-up:** A warm-up is not required for this meter.

6.2.4 The time, date and other display settings will be pre-established by the IH lab technologist. To check the time and date from the start menu use the arrow keys to move the cursor to Setup. Press the ***Enter*** key (large center button) to view the current time/date settings.

6.2.5 Press the ***Escape*** key to return to the start menu.

6.2.6 To check the alarm settings go to the setup menu and select Vibration.

6.2.7 Two alarm settings (TWA and Lavg) will be visible. The alarms are set for Dosimeter 1 (OSHA HC parameters). On indicates the unit is set to vibrate

on alarm.

6.3 **Clearing Data from the Memory:** The IH lab will clear data and reset the unit prior to pickup by the technician.

6.3.1 **Do not reset the unit if it was prepared by the IH lab.** To clear the memory, the instrument must not be running a study (pause mode). Reset the instrument to remove all data from session memory.

6.3.2 From the Start display press the ***RESET*** soft key and hold until during the countdown.

6.4 **Calibration of the Noise Pro DLX** (picture of meter and description of controls and displays is contained in Appendix 9.1.)

6.4.1 The Noise Pro DLX will allow for Pre- and Post-session calibration. Pre-session calibration may be adjusted by the user. However, the post calibration is not adjustable.

6.4.2 **Calibration:** Slide the calibrator *Power Switch* to ***On***. Check the battery indicator and replace batteries if necessary. Listen to hear if Calibrator is producing a tone.

6.4.3 Remove the windscreen from the microphone. Insert the dosimeter microphone into the calibrator adaptor.

Microphone inserted into calibrator

6.4.4 The instrument must be in the Start mode. If it is any other mode it must finish and be placed in the Start mode before it will allow calibration.

6.4.5 Press the soft key for ***Cal*** to display the calibration menu. The previous calibration data will appear.

6.4.6 Press the large ***ENTER*** key on the instrument. The Calibration Save display appears.

6.4.7 Use the up and down arrows to adjust the calibration level to that of the calibrator (114.0 dBA). Make sure the microphone is secure in the calibration unit.

6.4.8 Press the **ENTER** key to begin the calibration test. Pass or Fail will appear. If Fail appears return the instrument to the IH lab.

6.4.9 Remove the microphone from the calibrator, replace the windscreen and turn off the calibrator. Press the Escape key to return to the start mode. The meter is now ready to be used for monitoring.

6.4.10 Conduct the monitoring.

6.4.11 Upon completion of the final study for the monitoring period, pause the unit and press Escape to return to the Start mode for Post Calibration. **Do not end**

the Session at this time or post calibration will not be accepted.

6.4.12 Press the ***Cal*** soft key to enter the calibration mode.

6.4.13 Press the ***ENTER*** key to accept the post-calibration. The post calibration level can not be adjusted by the user.

6.4.14 If there is a substantial discrepancy between the pre and post calibrations inform the IH lab technologist and the IH professional reviewing the data. Do not use the data unless the problem is resolved.

6.4.15 Press the Escape key to return to start mode. The session may now be ended and the unit turned off.

6.4.16 When the Calibration data is stored, it will be included in the printout of each study. Also record the readings on the ***BNL Noise Dosimeter Form.***

6.5 Meter Operation:

The IH lab will set up and pre-calibrate the unit.

6.5.1 Turn the unit on using the ***On/Off*** key.

6.5.2 The unit will be set to read: Slow, dBA and calculate both OSHA and ACGIH exposure data simultaneously.

6.5.3 Pre-calibrate the unit in accordance with the procedure detailed in section 6.4.

6.5.4 When the start menu appears highlight View Current Study and press ***Enter***. The instrument begins reading the ambient SPL. The unit is still in the Pause mode as indicated by the double vertical lines on the lower right of the screen.

6.5.5 Ensure the windscreen (foam cylinder) is installed over the microphone.

6.5.6 Attach the microphone to the workers collar near the ear. Clip the meter to belt or place in a coat, suit, or pant's pocket. IMPORTANT NOTE: Unit must remain in the ***Pause*** mode to prevent the movement and handling of the microphone from being erroneously stored as noise exposure.

6.5.7 If the work location is static and the noise seems to come from one side, then put the microphone on that shoulder. During monitoring, keep clothing from coming into contact with the windscreen to avoid erroneous noise artifacts.

6.5.8 If the worker will enter an area known or suspected to be above 85dB, the worker must wear ear muffs or plugs. If the person sampling will enter an area known or suspected to be above 85dB, the sampler must wear ear muffs or plugs.

6.5.9 Once the instrument is on, you can start and stop studies with a single key.

Start and stop studies with the ***Run/Pause*** key. Pressing the ***Run/Pause*** key changes the icon from two vertical lines to an arrow indicating the unit is in the run mode. The run time is also displayed.

6.5.10 The display can be adjusted to read SPL, Dose, Averages, etc. using the arrow keys or the soft keys. For example, pressing the **AVG** softkey will display the current Lavg. The arrow keys will toggle between OSHA and ACGIH as indicated at the top of the screen.

6.5.11 You separate studies (such as before and after breaks for lunch) by pressing the ***Run/Pause*** key. This will pause the instrument for events such as leaving for lunch. Press the ***Run/Pause*** key again to begin a new study upon return to work. **When taking the instrument off the worker, pause the monitor *before* removing it** and start the monitor ***after*** repositioning the instrument on the worker. All events will be averaged together at the end to calculate a daily average and dose for the session.

6.5.12 When monitoring is completed, press the ***Run/Pause*** key to place the unit in pause mode. **Do not end the Session at this time or post calibration will not be accepted.**

6.5.13 Post-calibrate the meter as follows.

6.5.14 Press Escape key to return to start menu.

6.5.15 Press the soft key for ***Cal.*** Calibration will be highlighted. Press the ***Enter*** key. At the top of the screen the display will read Post-Calibration. Document the calibration level on the field form and press ***Enter*** to accept. The display will show the pre and post calibration values. Press the ***Escape*** key to return to the Start Menu.

6.5.16 From the start menu select Close Session. Use the arrow keys to highlight Close Session and hold the ***Enter*** key until the session is closed.

6.5.17 If the unit is being returned to the IH lab immediately it may remain in the Pause mode. It may also be turned off by holding the ***On/Off*** **key** during the countdown. Data will be saved in the unit.

6.5.18 Ensure all data is recorded on the ***BNL Noise Dosimeter Form.*** It is important to record what the worker was doing throughout the day with enough detail to correlate with the logged data.

6.5.19 Return the instrument to the IH lab.

6.6 **Printing the Logged Data Report:**

6.6.1 An IH technologist will use the Quest Suite software and infrared cable to communicate with the instrument and download the stored information.

6.6.2 A copy of the report will be provided to the monitor by the IH lab

technologist.

6.7 **Documenting Sampling Data and Work Condition readings:**

6.7.1 Use the ***BNL Noise Dosimeter Form*** to record field events and information.

6.7.2 Complete the ***Employee Notification Form*** and send a copy to the worker, the supervisor, the Clinic and the IH lab.

6.7.3 Enter data into the IH Noise Database.

6.7.4 Provide a copy of the printed data, the original *BNL Noise Dosimeter Form,* and the *Employee Notification Form* to the SHSD IH Laboratory Technician.

6.8 **Results interpretation**:

6.8.1 Noise monitoring data should be documented, recorded and employee notification provided in accordance with the SOP IH60500.

6.8.2 A competent person should write a hazard evaluation report that evaluates the survey data and summarizes the potential for occupational exposure and compliance with OSHA and ACGIH Occupational Exposure Limits.

6.8.3 Ensure that a copy of the hazard evaluation report is sent to the IH Laboratory and is included in the ESHQ Directorate Recordkeeping system.

6.8.4 Ensure that a copy of the written hazard evaluation report is sent to the Occupational Medicine Clinic with the worker's BNL Life Number noted.

Note: The hazard evaluation report and/or an *Employee Notification Form* must be used to inform all monitored employees of the results of the monitoring and the implication to compliance with OELs. Reporting to employees should be within 5 days of receiving results.

7.0 Implementation and Training

7.1 Training prior to using this meter includes a demonstration of proper operation of the instrument based on training, education, and experience. All persons must have met the qualification criteria for IH96 Noise Assessor set in *IH50300 BNL IH Program and IH Group Training & Qualification Matrix.*

7.2 Personnel are to document their training using Attachment 9.3, the Job Performance Measure Completion Certificate. Qualification on this JPM is required on a 3 year basis, providing the professional is monitoring noise sources frequently.

7.3 A baseline audiogram may be needed if the duration of exposure to the person performing the survey will be in excess of the OSHA Action Level or ACGIH Threshold Limit Value (TLV) (which ever is less). See IH96200.

7.4 Other appropriate training for the area to be entered (check with ESH coordinator or FS Representative for the facility).

8.0 References

8.1 Quest NoisePro Series Owner's Manual 053-379, Rev C Jan. 23, 2004
8.2 BNL SBMS Subject Area Noise and Hearing Conservation
8.3 OSHA Noise/Hearing Conservation 29CFR1910.95.
8.4 NIOSH Criteria for a Recommended Standard-Occupational Noise Exposure, 1998.
8.5 ACGIH American Conference of Governmental Industrial Hygienists Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.

9.0 Attachments

9.1 Photo of meter and parts
9.2 Short List of Operating Instructions
9.3 Quest Noise Pro DLX Dosimeter Qualification record: *Job Performance Measure Completion Certificate*

10.0 Documentation

Document Development and Revision Control Tracking		
PREPARED BY: *(Signature and date on file)* **J. W. Peters** **Date: 09/23/2005**	**REVIEWED BY:** *(Signature and date on file)* **R. Selvey** **Date: 09/26/05**	**APPROVED BY:** *(Signature and date on file)* **R. Selvey IH Manager** **Date: 09/26/05**
ESH Coordinator/ Date:	Work Coordinator/ Date:	SHSD Manager / Date

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division **INDUSTRIAL HYGIENE GROUP** Standard Operating Procedure: Field Procedure	NUMBER **IH96700**
	REVISION **Final Rev2**
SUBJECT: INSTRUMENT OPERATION: **Quest Noise_Pro_DLX Dosimeter**	DATE **02/01/06**
	PAGE **10** OF 15

none	*none*	*none*
QA Representative / Date: *none*	Training Coordinator / Date: *none*	Filing Code: **IH52.05**
Facility Support Rep. / Date: *none*	Environ. Compliance Rep. / Date: *none*	Effective Date: **09/26/05**
ISM Review - Hazard Categorization ☐ High ☒ Moderate ☐ Low/Skill of the craft	Validation: ☐ Formal Walkthrough ☒ Desk Top Review ☐ SME Review Name / Date:	Implementation: Training Completed: Tracked in BTMS Procedure posted on Web: 02/01/06 Hard Copy files updated: 02/01/06

Revision Log

Purpose: ☐ Temporary Change ☐ Change in Scope ☐ Periodic review ☒ Clarify/enhance procedural controls
Changed resulting from: ☐ Environmental impacts ☐ Federal, State and/or Local requirements ☐ Corrective/preventive actions to non-conformances ☒ none of the above
Section/page and Description of change: Revised Section 7 training requirements. Updated Section 10 to new format.

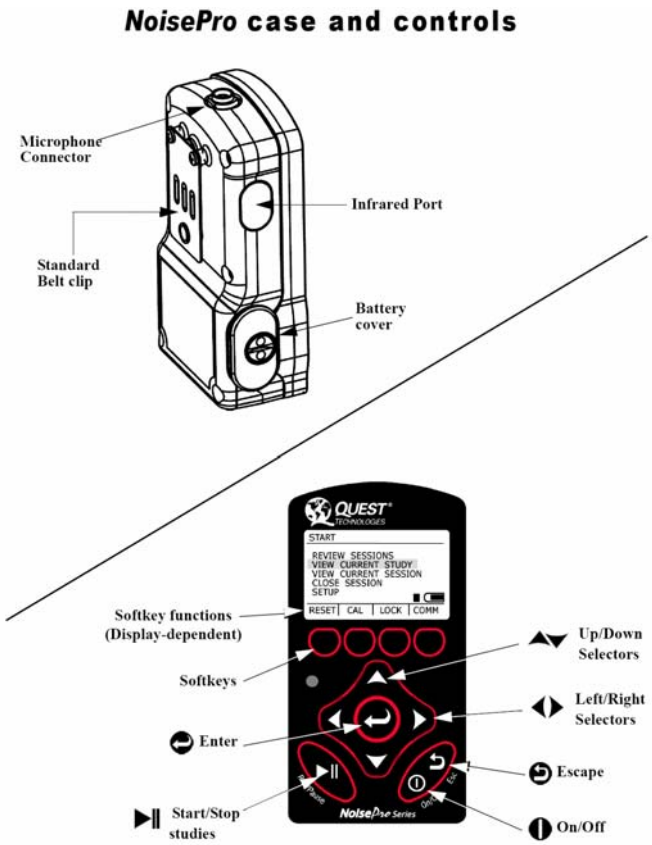
(signature/date on file) R. Selvey 11/02/05 SME Reviewer/Date:	SME Reviewer/Date:	SME Reviewer/Date:

Purpose: ☐ Temporary Change ☐ Change in Scope ☐ Periodic review ☒ Clarify/enhance procedural controls
Changed resulting from: ☐ Environmental impacts ☐ Federal, State and/or Local requirements ☐ Corrective/preventive actions to non-conformances ☒ none of the above
Section/page and Description of change: Added 6.5.8. Correct OSHA Action Level in Section 7.3.

(signature/date on file) R. Selvey 02/01/06 SME Reviewer/Date:	SME Reviewer/Date:	SME Reviewer/Date:

BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division INDUSTRIAL HYGIENE GROUP Standard Operating Procedure: Field Procedure	NUMBER **IH96700**
	REVISION **Final Rev2**
SUBJECT: INSTRUMENT OPERATION: **Quest Noise_Pro_DLX Dosimeter**	DATE **02/01/06**
	PAGE **11** OF 15

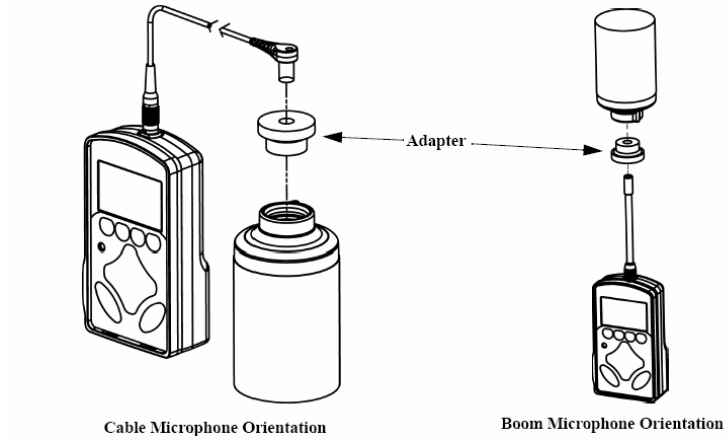
Attachment 9.1
Photo of the Meter and Parts



BROOKHAVEN NATIONAL LABORATORY Safety & Health Services Division INDUSTRIAL HYGIENE GROUP Standard Operating Procedure: Field Procedure	NUMBER **IH96700**
	REVISION **Final Rev2**
SUBJECT: INSTRUMENT OPERATION: **Quest Noise_Pro_DLX Dosimeter**	DATE **02/01/06**
	PAGE **12** OF 15

Attachment 9.1

Photo of the Calibration Setup



Attachment 9.2

Short Operating Instructions

Step		User Action
1	**Power On**	Press ***On/Off key***
2	**Battery Check**	Observe screen for warning ***LoBAT.***
3	**Warm-Up**	A warm-up is not required for this meter.
4	**Pre- Calibration**	To calibrate and store the calibration data. Clear data. • Press soft key ***RESET*** and hold during countdown.
		• Slide the calibrator *Power Switch* to On. • Remove the windscreen from the microphone. Insert the dosimeter microphone into the calibrator adaptor. • Press soft key ***Cal*** then ***Enter*** Key**.** Use the arrow keys to set the Noise Pro DLX to read 114.0 dB.
		• Press the ***Enter*** key to begin calibration test. The instrument will read pass or fail when complete. Press the ***Escape*** key to return to the start menu.
		Remove the microphone from the calibrator, replace the windscreen, and turn off the calibrator.
		The meter is now ready to be used for monitoring.
5	**Dosimeter Set-up**	Attach the microphone to the workers collar near the ear. Clip meter to belt. (Note: Unit should be in Pause mode.
6	**Operation**	Press the ***Run/Pause*** key to start a study, the ***Enter*** key to view the Display of SPL.
		If you need to pause the event: press ***Run/Pause*** so the Pause display shows next to the battery indicator. Before and after lunch break pause the unit then restart with the ***Run/Pause*** key.
7	**Stop Logging**	When monitoring is complete, press ***Run/Pause*** to pause. Then remove the unit from the worker.
8	**Post-Calibration**	Press the ***Escape*** key to return to the Start menu. Remove the windscreen, turn on the calibrator and place the microphone in the calibrator. Press the ***Cal*** softkey**.** Press the ***Enter*** key. Post calibration will appear at the top. No changes may be made to the calibration level. Press ***Enter*** to save the post calibration result. Press ***Escape*** to return to the Start menu. Replace the windscreen and turn off the calibrator.
	Ending a Session or Power Off	You may end the session by turning off the unit or selecting Close Session from the menu. To turn off the unit, hold the ***On/Off*** key during the countdown. Data will be saved in the unit. To close a session, select Close Session from the start menu and hold the ***Enter*** key during the countdown.

Attachment 9.3

Quest Noise Dosimeter
Noise Pro DLX Qualification Form

Job Performance Measure Completion Certificate

(see next page)

BROOKHAVEN NATIONAL LABORATORY

IH96700 Attachment 9.3
HP-IHP-96700

Industrial Hygiene Program

Noise and Hearing Conservation
Noise Dosimetry with the Quest NoiseProDLX

Job Performance Measure (JPM) Completion Certificate

Candidate's Name	Life Number:

Practical Skill Evaluation: Demonstration of Evaluation Methodology by Oral Exam

Criteria	Qualifying Performance Standard	Unsat.	Recov.	Satisf.
1. Hazard Analysis	Understands the need to perform a hazard analysis of the area and potential exposure to the self as sampler and workers in the area.			
2. Personal Protective Equipment	Understands the need to be aware of the potential surface contamination, airborne levels of contaminants, radiological hazards, and noise hazards. Knows how to determine the need for PPE.			
3. Sampling Equipment	Knows where equipment needed for the procedure is located and how to properly sign it out.			
6. Operating Parameters	Knows the theory to establish operating parameters (safety envelope) for the equipment.			
7. Documentation	Demonstrates correctly filling out IH monitoring forms.			

IH Noise Meter Operation - Practical Skill Evaluation: Demonstration of Methodology

Criteria	Qualifying Performance Standard	Unsat.	Recov.	Satisf.
1. Turning the Meter On and Off	Demonstrates correctly activating the meter and turning it off			
2. Calibration of the Meter	Demonstrates correctly pre/post calibration of the meter			
3. Setup & Settings	Demonstrates review of setup parameters, changing information, viewing data onscreen, and understanding alarms.			
4. Taking readings	Demonstrates how to correctly attach the meter to worker, when to pause and restart, and correctly removing the unit.			
5. Documentation and Reporting Criteria	Demonstrates how to correctly document work and results, notify worker of exposure data, and requirements for data entry.			

I accept the responsibility for performing this task as demonstrated within this JPM and the corresponding SOP.

Candidate Signature:	Date:

I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature:	Date: